

REMARKS

This Amendment is filed in response to the Office Action dated September 14, 2010. For the following reasons this application should be allowed and the case passed to issue. No new matter is introduced by this Amendment. The amendment to claim 1 is supported by the specification at page 5, lines 25-27; page 9, lines 5-17; and Examples 1-5. The inner diameter of the catalyst structure of Examples 1-5 is 4-12 nm, which is the same size as a diameter of a typical carbon nanotube. Thus, it is clear that a ring of catalyst structure corresponds to one carbon nanotube.

Claims 1, 3-6, and 8-15 are pending in this application. Claims 8-15 were withdrawn pursuant to a restriction requirement. Claims 1 and 3-6 were rejected. Claim 1 is amended in this response. Claims 2 and 7 were previously canceled.

Claim Rejections Under 35 U.S.C. § 103

Claims 1 and 3-5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Delzeit (US 6,858,197).

Claim 6 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Delzeit in view of Fan et al. (Science vol. 283, pages 512-514, (1999)).

These rejections are traversed, and reconsideration and withdrawal thereof respectfully requested. The following is a comparison between the present invention, as claimed, and the cited prior art.

Delzeit and Fan et al., whether taken in combination, or taken alone, do not suggest the claimed assembly of a plurality of catalyst structures because Delzeit and Fan et al. do not suggest the catalyst structure is shaped as a pipe with its even upper surface serving as a crystal growth surface, the catalyst structure includes a catalytic material that forms a ring

corresponding to a carbon nanotube on the crystal growth surface, and at least part of a side of the structure shaped as a pipe has a non-catalytic material with substantially no catalytic activity with respect to a growth of the crystalline carbon, as required by claim 1.

In the present invention, the catalytic material forms a **ring** in the crystal growth surface 22 where the whole of the catalyst structure is shaped as a **pipe**, as shown in Fig. 2C. Delzeit, on the other hand, discloses that the structure of the catalyst can be formed as the number 8, which is a two-ring shape where the whole of the structure is a layered structure, as shown in Figs. 1, 4, and 5. Delzeit fail to teach or suggest that the catalyst structure is shaped as a **pipe**, as required by claim 1.

In the present invention, the upper surface (see "22" in Fig. 2C) of the catalyst structure is the crystal growth surface and the side (see "25" and "26" in Fig. 2C) of the catalyst structure contains a non-catalytic material. Although it is not clear where the crystal structure is in Figs. 1, 4, and 5 of Delzeit, Delzeit fails to teach or suggest that the surface perpendicular to the crystal growth surface (side wall of pipe structure) contains a non-catalytic material, as required by claim 1.

The present invention is an assembly of a plurality of catalyst structures, wherein the crystal growth surface of the assembly has many rings because each of the catalyst structures has a ring of a catalytic material in its crystal growth surface (see page 9, lines 5-17 and Examples 1-5 of Specification). Each of the rings corresponds to a carbon nanotube, and a carbon nanotube is formed reflecting the geometry of the ring (page 5, lines 25-27 and page 6, lines 19-20 of the Specification). Since the center of the ring is without a catalytic material, a carbon nanotube may be manufactured without a closed cap portion on its tip (page 6, lines 5-7 of Specification). The patterning catalyst of Delzeit, on the other hand, controls the **regions** where carbon

nanotubes are grown and does not control the **configuration** of the carbon nanotube like the present invention (see Delzeit, col. 4:32-34). Further, Delzeit fails to disclose or suggest an assembly of a plurality of catalyst structures and an assembly with a crystal growth surface having many rings of a catalytic material.

Fan et al. do not cure the deficiencies of Delzeit.

Obviousness can be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge readily available to one of ordinary skill in the art. *In re Kotzab*, 217 F.3d 1365, 1370 55 USPQ2d 1313, 1317 (Fed. Cir. 2000); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992); *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). There is no suggestion in Delzeit or Fan et al. to modify the catalyst structure of Delzeit to obtain an assembly of catalyst structures where the catalyst structure is shaped as a pipe with its upper surface serving as a crystal growth surface, the catalyst structure includes a catalytic material that forms a ring corresponding to a carbon nanotube on the crystal growth surface, and at least part of a side of the structure shaped as a pipe has a non-catalytic material with substantially no catalytic activity with respect to a growth of the crystalline carbon, as required by claim 1.

The only teaching of the claimed catalyst structure is disclosed in Applicant's specification. However, the teaching or suggestion to make a claimed combination and the reasonable expectation of success must not be based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

The dependent claims are allowable for at least the same reasons as claim 1, and further distinguish the claimed catalyst structure. For example, claim 5 further requires the crystal


growth surface has a multilayer structure with catalytic and non-catalytic material. The cited references do not suggest catalyst structures with this additional limitation.

In view of the above amendments and remarks, Applicant submits that this application should be allowed and the case passed to issue. If there are any questions regarding this Amendment or the application in general, a telephone call to the undersigned would be appreciated to expedite the prosecution of the application.

To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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